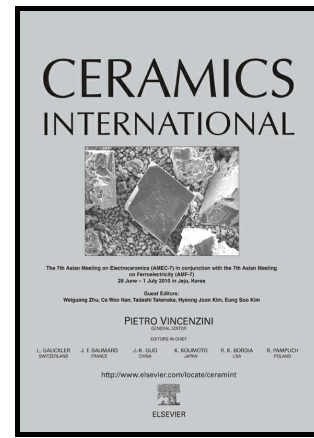


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Crystallization of SiC and its effects on microstructure, hardness and toughness in TaC/SiC multilayer films

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Abstract

A series of TaC/SiC multilayer films with different SiC thicknesses (t_{SiC}) have been prepared by magnetron sputtering and their microstructure, hardness and toughness investigated by X-ray diffraction (XRD), transmission electron microscopy (TEM), atomic force microscopy (AFM), scanning electron microscopy (SEM) and nanoindentation. Results show that SiC crystallized and grew coherently with TaC layers at low t_{SiC} (≤ 0.8 nm), resulting from the template effect of TaC layers. Maximum hardness and toughness of 46.06 GPa and $4.21 \text{ MPa m}^{1/2}$ were achieved at $t_{\text{SiC}}=0.8$ nm with good coherent interface. With further increasing of t_{SiC} , SiC layers partially transformed to an amorphous structure and gradually lost their coherent

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